

HURRICANE SANDY

IN NEW JERSEY
AND NEW YORK

Crosswalk of Recommendations with National Disaster Recovery Framework Goals

The National Disaster Recovery Framework (NDRF) identifies scalable, flexible, and adaptable coordinating structures to align key roles and responsibilities of local, State, Tribal, and Federal governments to enable these organizations to work with each other and with private sector, non-profit organizations, and community organizations in expediting recovery of core essential community functions (Figure J-1, FEMA 2011b). The NDRF draws on contributions from each of these partners in a framework that organizes resources, capabilities, and best practices to increase our Nation's resiliency, enable rapid recovery from a disaster, and improve mitigation actions that can reduce losses in future events. Each RSF is coordinated by a lead Federal agency and has Primary agencies and supporting organizations to assist the lead agency. The Federal coordination of the RSFs is summarized in Table J-1.

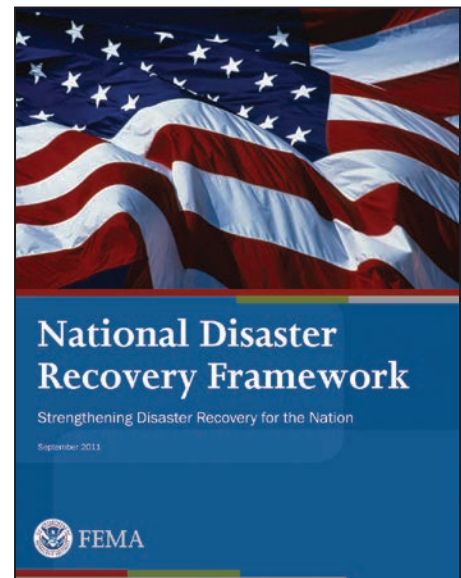


Figure J-1: FEMA's National Disaster Recovery Framework

In developing MAT recommendations, the team coordinated with RSF lead agencies including U.S. Department of Homeland Security, the U.S. Department of Health and Human Services, U.S. Army Corps of Engineers, U.S. Department of Housing and Urban Development, U.S. Department of Commerce, and U.S. Department of the Interior (as well as other Federal, State, and local partners). This appendix provides a crosswalk of the NDRF objectives with MAT recommendations.

Hurricane Sandy is the first large-scale application of the recently created NDRF. To meet the special needs of Hurricane Sandy, an Executive Order signed by President Obama created the Hurricane Sandy Rebuilding Task Force on December 7, 2012. Working in conjunction with the NDRF, the Task Force released *The Hurricane Sandy Rebuilding Strategy Report* (Figure J-2, FEMA 2013). The Task Force report addresses a full range of high-level Federal recovery goals. The Task Force report recommendations relating to the MAT are cross-referenced to MAT recommendations in Table J-2.



Figure J-2: Hurricane Sandy Rebuilding Task Force report

Table J-1: NDRF RSF Interagency Responsibility Matrix

Agency	Recovery Support Function					
	Infrastructure Systems	Economics	Housing	Health and Social Services	Community Planning and Capacity Building	Natural and Cultural Resources
Department of Homeland Security / Federal Emergency Management Agency	Primary	Primary	Primary	Primary	Coordinating	Primary
Department of Homeland Security	Supporting				Supporting	
Department of Homeland Security / Office for Civil Rights and Civil Liberties				Primary		
Department of Homeland Security / National Protection and Programs Directorate	Primary			Primary		Supporting
Department of Health and Human Services	Supporting	Supporting	Supporting	Coordinating	Primary	
Department of Commerce	Supporting	Coordinating	Supporting		Supporting	Supporting
Department of the Interior	Supporting	Supporting		Primary	Supporting	Coordinating
Department of Justice			Primary	Primary	Supporting	
Department of Transportation	Primary			Supporting	Supporting	
Delta Regional Authority	Supporting	Supporting			Supporting	Supporting
Department of Energy	Supporting			Primary	Supporting	
Environmental Protection Agency	Supporting	Supporting	Supporting	Primary	Supporting	Primary
General Services Administration	Supporting		Supporting		Supporting	Supporting
Department of Housing and Urban Development	Supporting	Supporting	Coordinating		Supporting	
Small Business Administration		Primary	Supporting	Supporting	Supporting	
Department of the Treasury	Supporting	Primary		Supporting		
U.S. Department of Agriculture	Supporting	Primary	Primary	Supporting	Supporting	Supporting
Department of Labor		Primary		Primary		
Department of Veterans Affairs			Supporting	Supporting		
American Red Cross			Supporting	Supporting		
National Voluntary Organizations Active in Disaster			Supporting	Supporting		
U.S. Access Board			Supporting			
Department of Defense	Supporting					
Department of Defense / U.S. Army Corps of Engineers	Coordinating					Supporting
Department of Energy	Primary		Supporting			
Federal Communications Commission	Supporting					
Nuclear Regulatory Commission	Supporting					
Tennessee Valley Authority	Supporting					
Advisory Council on Historic Preservation						Supporting
Council on Environmental Quality						Supporting
Institute of Museum and Library Services						Supporting
Library of Congress						Supporting
National Archives and Records Administration						Supporting
National Endowment for the Arts						Supporting
National Endowment for the Humanities						Supporting
Corporation for National and Community Services		Supporting	Supporting	Primary	Supporting	
Heritage Preservation						Supporting

Legend: □ = Not Applicable ■ = Coordinating Agency ■ = Primary Agency ■ = Supporting Organizations

SOURCE: Data from HUD. 2013. *New York Recovers: Hurricane Sandy Federal Recover Support Strategy* (Federal Recovery Support Strategy)

Table J-2: Task Force Report Recommendations Compared to MAT Recommendations

Task Force Report Recommendations*	MAT Recommendation**
<p>2. Develop a minimum flood risk reduction standard for major Federal investment that takes into account data on current and future flood risk (pg. 44)</p>	<p>1. Perform vulnerability assessments 22. Propose changes to I-Codes 30a. Elevate new and Substantially Damaged/ Improved structures to protect from flooding 30b. Elevate existing structures to protect from flooding 30c. Building designs should account for flood conditions 30d. Improve protection of subgrade areas outside the SFHA 31. Designers should consider the potential impacts of sea level rise 33a. Submit a proposal to modify ASCE 24, Section 7.1 commentary</p>
<p>6. Federal, State, and local agencies should continue to coordinate Sandy recovery infrastructure resilience projects (pg. 55)</p>	<p>2. NJDEP, NJDCA, and FEMA should coordinate review 3. NJDEP should evaluate FEMA model floodplain management ordinance 4. Develop training on flood provisions of New Jersey building code 5. Establish formal consultation process 6. Amend the UCC 7. NYSDEC should evaluate FEMA model floodplain management ordinance 8. Develop optional provisions for model local law 10. Develop training on flood provisions of New York building code 11. Update DCEA technical bulletin on flood venting 12. Amend New York State Code 13. Modify proposed New York City code amendments 14. The DOB should establish protocol to verify data 15. Establish mechanism for special inspections 16. Amend Appendix G of New York City Building Code 22. Propose changes to I-Codes 23a. Document performance of erosion control structures 23b. Review mapping procedures 23c. Conduct detailed evaluation of damage behind erosion control structures 24a. Review dune loss criterion 24b. Develop siting and design guidance for Sandy affected coastal areas 24c. Identify barrier islands with history of breaching 25a. Reference FEMA guidance regarding foundations for new construction 25d. Develop mitigation guidance for existing residential buildings 26b. Perform regular inspections for compromised connections 26d. Publish prescriptive load path details 26e. Require plans and specifications to show load path connections 28. Local jurisdictions should determine what facilities are critical and essential 29a. Develop educational materials on below-grade flooding vulnerabilities 30a. Elevate new and Substantially Damaged/Improved structures to protect from flooding 30d. Improve protection of subgrade areas outside the SFHA 31. Designers should consider the potential impacts of sea level rise</p>

Table J-2: Task Force Report Recommendations Compared to MAT Recommendations (concluded)

Task Force Report Recommendations*	MAT Recommendation**
13. Mitigate future impacts to the liquid fuels supply chain like those experienced during the Sandy recovery (pg. 67)	44a. Prepare a plan for maintaining fuel supplies 44b. Protect subgrade fuel pumps from flooding
16. Develop a resilient power strategy for wireless and data communications infrastructure and consumer equipment (pg. 69)	40c. Facility owners and operators should develop holistic plans to limit disruption of critical functions
25. States and localities should adopt and enforce the most current version of the IBC and the IRC (pg. 82)	6. Amend the UCC 8. Develop optional provisions for model local law 12. Amend New York State Code 13. Modify proposed New York City code amendments 22. Propose changes to I-Codes
54. Encourage increased hazard mitigation activities including elevation in order to protect property against future losses (pg. 54)	1. Perform vulnerability assessments 14. The DOB should establish protocol to verify data 15. Establish mechanism for special inspections 16. Amend Appendix G of New York City Building Code 23a. Document performance of erosion control structures 23b. Review mapping procedures 23c. Conduct detailed evaluation of damage behind erosion control structures 24a. Review dune loss criterion 24b. Develop siting and design guidance for Sandy-affected coastal areas 24c. Identify barrier islands with history of breaching 25a. Reference FEMA guidance regarding foundations for new construction 25d. Develop mitigation guidance for existing residential buildings 26d. Publish prescriptive load path details 27. Install siding properly 28. Local jurisdictions should determine what facilities are critical and essential 29a. Develop educational materials on below-grade flooding vulnerabilities 30a. Elevate new and Substantially Damaged/Improved structures to protect from flooding 30d. Improve protection of subgrade areas outside the SFHA 31. Designers should consider the potential impacts of sea level rise 32. Building owners should elevate, relocate, or protect building systems above the BFE 33a. Submit a proposal to modify ASCE 24, Section 7.1 commentary 34. Protect critical building systems in subgrade areas 35. Establish points for temporary power connection 36a. Emergency plans should address the possibility of elevator failure 37a. Design installation of large fuel storage tanks to resist flotation and implosion 37b. Protect tanks in subgrade areas from flood damage 38. Install fuel pumps in large storage tanks to maintain operations 39. Install sump pumps to remove seepage from subgrade areas 40a. Building owners should provide emergency power systems for facilities 40c. Facility owners and operators should develop holistic plans to limit disruption of critical functions

* Hurricane Sandy Rebuilding Task Force. 2013. *The Hurricane Sandy Rebuilding Strategy Report*.

** See Chapter 7 for full context of MAT recommendations.

While the Task Force report provides a general thematic view of the Federal support of recovery, organized around key event needs, a second report—the Federal Recovery Support Strategy (RSS) prepared under the NDRF, *New York Recovers: Hurricane Sandy Federal Recover Support Strategy* (Figure J-3, HUD 2013a)—provides clear actionable items organized by RSFs. While the RSS recommendations were developed for New York specifically, this report provides a useful model of the NDRF that can be applied in other locations. Similar specific NDRF plans are being developed in New Jersey and other areas impacted by Sandy.

Tables J-3 through J-7 compare the recommendations of the MAT with selected related NDRF recommendations and related RSS recommendation, grouped by RSF. Tables J-3 through J-7 are not intended to be a comprehensive cross-walk between the NDRF, the RSS, and the MAT recommendations, but are rather intended to show how MAT recommendations, based upon specific field observations, correlate to NDRF RSFs.



Figure J-3: Federal Recovery Support Strategy for New York

Table J-3: Crosswalk of MAT Recommendations with NDRF RSF – Housing

NDRF RSF Outcomes*	Hurricane Sandy Federal Recovery Support Strategy (NY)**	Supporting MAT Recommendation	Applicability
<p>Housing resources that address local, State, and Tribal disaster recovery housing needs are coordinated.</p> <p>Planning for current and post-disaster requirements are integrated into the organizations at the local and State level that perform land and community planning and building code administration.</p> <p>Local, State, Tribal and Federal programs, industry and construction options for addressing post-disaster housing needs are in place.</p> <p>Research results related to the disaster recovery housing area are shared.</p> <p>Interagency knowledge and expertise are shared with State-led housing task forces to address disaster housing issues.</p> <p>Pre- and post-disaster interaction and problem solving among Federal agencies and stakeholders with a focus on reconstructing permanent housing, including affordable and accessible housing that incorporates resilience, sustainability and mitigation concepts are facilitated.</p> <p>Timely construction of housing that complies with local, State and national model building codes, including accessibility standards, is facilitated.</p> <p>Loss of historic buildings and resources is minimized.</p>	<p>Strategic Initiative 1.1 – Coordinate with federal partners and relevant stakeholders to promote resiliency in recovery efforts (pg. 66)</p>	<p>Codes and standards – New Jersey</p> <p>2. NJDEP, NJDCA, and FEMA should coordinate review</p> <p>3. NJDEP should evaluate FEMA model floodplain management ordinance</p> <p>6. Amend the UCC</p>	<p>NJDEP and NJDCA with support from FEMA</p> <p>NJDEP with support from FEMA</p> <p>NJDCA</p>
	<p>Strategic Initiative 1.2 – Ensure that [revitalization] integrates housing, land use, economic and workforce development, transportation, and infrastructure investments (pg. 67)</p>	<p>Codes and standards – New York State</p> <p>8. Develop optional provisions for model local law</p> <p>10. Develop training on flood provisions of New York building code</p> <p>11. Update DCEA technical bulletin on flood venting</p> <p>12. Amend New York State Code</p>	<p>DCEA, NYSDEC</p> <p>DCEA, NYSDEC, FEMA</p> <p>DCEA, NYSDEC</p> <p>DCEA</p>
	<p>Strategic Initiative 2.5 – Support state, county, and city development of Sandy mitigation and resiliency programs (pg. 75)</p>	<p>Codes and standards – New York City</p> <p>13. Modify proposed New York City code amendments</p> <p>14. The DOB should establish a protocol to verify data</p> <p>15. Establish a mechanism for special inspections</p>	<p>NYC DOB</p> <p>NYC DOB</p> <p>NYC DOB</p>
	<p>Strategic Initiative 5.5 – Develop a strong public message with emphasis on the opportunity provided by recovery to build better housing (pg. 90)</p>	<p>Structural</p> <p>25a. Reference FEMA guidance regarding foundations for new construction</p> <p>25b. Elevate existing low-rise buildings where possible</p> <p>25c. Fill below-grade areas of buildings in the SFHA</p> <p>25d. Develop mitigation guidance for existing residential buildings</p> <p>26a. Retrofit existing homes to improve load paths</p> <p>26b. Perform regular inspections for compromised connections</p> <p>26c. New home designs should adequately address flood risk</p> <p>26d. Publish prescriptive load path details</p> <p>26e. Require plans and specifications to show load path connections</p> <p>27. Install siding properly</p>	<p>Federal, State, and local officials, building owners, design professionals, builders</p> <p>Local community, building owners, design professionals</p> <p>Local community, building owners, design professionals</p> <p>FEMA</p> <p>Local community, building owners, design professionals, builders</p> <p>Building owners/operators</p> <p>Local community, design professionals, builders</p> <p>FEMA, Trade organizations</p> <p>ICC, Local community</p> <p>Builders, code officials</p>
		<p>Building systems – general</p> <p>32. Building owners should elevate, relocate, or protect building systems above the BFE</p>	<p>Building owners, design professionals</p>

Table J-3: Crosswalk of MAT Recommendations with NDRF RSF – Housing (concluded)

NDRF RSF Outcomes*	Hurricane Sandy Federal Recovery Support Strategy (NY)**	Supporting MAT Recommendation	Applicability
		<p>Building systems – elevators</p> <p>36a. Emergency plans should address the possibility of elevator failure</p> <p>36b. Facilities should protect elevator service, especially when it is essential to function</p>	<p>Facility owners/operators, design professionals</p> <p>Facility owners/operators, design professionals</p>

* FEMA. 2011. *National Disaster Recovery Framework, Strengthening Disaster Recovery for the Nation*

BFE base flood elevation
DCEA Division of Code Enforcement and Administration (New York State)

NYC DOB New York City Department of Buildings
NYSDEC New York State Department of Environmental Conservation

** HUD. 2013. *New York Recovers: Hurricane Sandy Federal Recover Support Strategy* (Federal Recovery Support Strategy) While these recommendations were developed for New York specifically, this report provides a useful model of the NDRF that can be applied in other locations.

FEMA Federal Emergency Management Agency
MAT Mitigation Assessment Team
NDRF National Disaster Recovery Framework
NJDCA New Jersey Department of Community Affairs
NJDEP New Jersey Department of Environmental Protection

SFHA Special Flood Hazard Area
UCC Uniform Construction Code

Table J-4: Crosswalk of MAT Recommendations with NDRF RSF – Infrastructure Systems

NDRF RSF Outcomes*	Hurricane Sandy Federal Recovery Support Strategy (NY)**	Supporting MAT Recommendation	Applicability
<p>Resilience, sustainability, and mitigation are incorporated as part of the design for infrastructure systems and as part of the community's capital planning process.</p> <p>Infrastructure systems are fully recovered in a timely and efficient manner to minimize the impact of service disruptions. The private sector critical infrastructure has the incentive and the means to support a unified community and national recovery effort.</p> <p>The capacity of all infrastructure systems is adequately matched to the community's current and projected demand on its built and virtual environment.</p>	<p>Recovery Priorities – Energy</p> <ul style="list-style-type: none"> Utilities and generation owners should consider proactively shutting down electric power stations and substations in [high hazard areas] prior to storm arrival (pg. 97) Substations that receive electric power transmission feeds into New York City and Long Island should be [considered] critical and afforded the maximum protective measures (pg. 97) Electric utility providers should evaluate ... generation, transmission, and distribution systems to identify and mitigate critical failure points (pg. 98) [Upgrade] transformers from aluminum to galvanized steel lattice or concrete (pg. 98) Protect electricity generation facilities by building berms around high-risk [areas] (pg. 98) Design backup power generators with provisions for ongoing fuel supplies and ... better recharging requirements (pg. 98) Conduct analysis to identify all substations and transformers critical to energy generation stations (pg. 98) 	<p>General conclusions and recommendations</p> <p>1b. Perform vulnerability assessments for all critical facilities – identify criticality</p> <p>Codes and standards – New Jersey</p> <p>2. NJDEP, NJDCA, and FEMA should coordinate reviews</p> <p>Codes and standards – New York State</p> <p>7. NYSDEC should evaluate FEMA model floodplain management ordinance</p> <p>8. Develop optional provisions for model local law</p> <p>9. Modify the hospital code to make flood provisions mandatory</p>	<p>Local community, facility owners/operators, design professionals</p> <p>NJDEP and NJDCA with support from FEMA</p> <p>NYSDEC</p> <p>DCEA, NYSDEC</p> <p>Building officials, State health commissioners</p>

Table J-4: Crosswalk of MAT Recommendations with NDRF RSF – Infrastructure Systems (continued)

NDRF RSF Outcomes*	Hurricane Sandy Federal Recovery Support Strategy (NY)**	Supporting MAT Recommendation	Applicability
<ul style="list-style-type: none"> Build separate backup power sources (generators) for electric power generation stations (pg. 99) Consider building floodwalls around generation stations and substations at risk of flooding, tidal flooding, or storm surge (pg. 99) Strengthen substations, transformers, connections, and all transmission and distribution equipment providing power to power generating and transmission stations so as to ensure they remain operational [during severe storm events] (pg. 99) Ensure power generating stations have redundant communications systems to supplement fiber optic communications lines (pg. 99) Protect conduits, connections, and transmission lines leading to power stations from substations transformers, and backup power generators (pg. 99) Elevate or move to higher, inland locations substations and transformers in flood zones (pg. 99) Conduct a systems analysis and begin selective burying of power lines underground based on risk (pg. 99) Electric power transmission and distribution lines should be rerouted to accessible areas (pg. 100) Electricity restoration prioritization plans should be reviewed to update critical infrastructure assets (pg. 100) New York could be modernized to take advantage [of ways to] improve the efficiency and control of electric grid power generation (pg. 101) <p>Recovery Priorities – Petroleum</p> <ul style="list-style-type: none"> Pipeline transmission systems have critical hubs and junctions that must be strengthened (pg. 104) Electric substations providing electric supply to pipeline hubs and major pumping stations should not be located in flood zones (pg. 104) Ensure that no one pipeline hub location could be a single point of failure that would compromise the system (pg. 104) Petroleum terminals and distribution centers should evaluate the best placement of electric service in order to maintain power (pg. 106) Petroleum and fuel transportation and distribution infrastructure should ensure they are able to refuel generators (pg. 106) 	<p>Recovery Priorities – Energy (concluded)</p>	<p>Codes and standards – New York City</p> <p>13. Modify proposed New York City code amendments – flood provisions</p> <p>16. Amend Appendix G of New York City Building Code – flood provisions</p> <p>17. Revise NYC School Construction Authority Design Standards – flood provisions</p>	<p>NYC DOB</p> <p>NYC DOB</p> <p>NYC DOB</p>
	<p>• Elevate or move to higher, inland locations substations and transformers in flood zones (pg. 99)</p>	<p>Codes and standards – FEMA</p> <p>22. Propose changes to I-Codes</p>	<p>FEMA, building officials</p>
	<p>• Conduct a systems analysis and begin selective burying of power lines underground based on risk (pg. 99)</p> <p>• Electric power transmission and distribution lines should be rerouted to accessible areas (pg. 100)</p> <p>• Electricity restoration prioritization plans should be reviewed to update critical infrastructure assets (pg. 100)</p> <p>• New York could be modernized to take advantage [of ways to] improve the efficiency and control of electric grid power generation (pg. 101)</p>	<p>Siting</p> <p>23a. Document performance of erosion control structures</p> <p>23b. Review mapping procedures</p> <p>23c. Conduct detailed evaluation of damage behind erosion control structures</p> <p>24a. Review dune loss criterion</p> <p>24b. Develop siting and design guidance for Sandy-affected coastal areas</p> <p>24c. Identify barrier islands with history of breaching</p>	<p>FEMA</p> <p>FEMA</p> <p>FEMA</p> <p>FEMA</p> <p>FEMA</p> <p>Federal, State, and local officials, State SeaGrants, academia, planners</p>
	<p>• Pipeline transmission systems have critical hubs and junctions that must be strengthened (pg. 104)</p> <p>• Electric substations providing electric supply to pipeline hubs and major pumping stations should not be located in flood zones (pg. 104)</p> <p>• Ensure that no one pipeline hub location could be a single point of failure that would compromise the system (pg. 104)</p> <p>• Petroleum terminals and distribution centers should evaluate the best placement of electric service in order to maintain power (pg. 106)</p> <p>• Petroleum and fuel transportation and distribution infrastructure should ensure they are able to refuel generators (pg. 106)</p>	<p>Structural</p> <p>28. Local jurisdictions should determine what facilities are critical and essential</p> <p>29a. Develop educational materials on below-grade flooding vulnerabilities</p>	<p>State, local community</p> <p>FEMA</p>

Table J-4: Crosswalk of MAT Recommendations with NDRF RSF – Infrastructure Systems (continued)

NDRF RSF Outcomes*	Hurricane Sandy Federal Recovery Support Strategy (NY)**	Supporting MAT Recommendation	Applicability
<p>Recovery Priorities – Wastewater Treatment Plants (concluded)</p> <ul style="list-style-type: none"> Pumping stations of vital importance to wastewater treatment systems should have generators capable of providing backup power to maintain operational capability and perform essential functions during disasters (pg. 113) <p>Recovery Priorities – Wastewater Treatment Plants</p> <ul style="list-style-type: none"> Bulkheads should be strengthened to provide additional protection to wastewater treatment plants located close to bodies of water (pg. 113) <p>Recovery Priorities – Transportation</p> <ul style="list-style-type: none"> Elevate roadway traffic signal electrical control boxes to protect against flooding and salt water inundation/exposure (pg. 122) Raise or construct floodwater control measures to protect roadways and embankments from immersion and scour (pg. 122) Stabilize slide-prone areas, slopes, embankments, and rock walls around bridges to mitigate scour threat (pg. 122) <p>Recovery Priorities – Mass Transit (Railroad)</p> <ul style="list-style-type: none"> Evaluate procuring backup substations and generators (pg. 124) Consider pre-wiring for generator hookups at key locations to facilitate use of portable generators at critical locations (pg. 125) Consider reengineering third rail-powered sectionalizing units [to] protect against exposure to brackish and salt water (pg. 125) Consider improvements to protect against flooding in tunnels through tunnel portals and the elevation of street-level vents (pg. 125) <p>Recovery Priorities – Mass Transit (Metropolitan Transportation Authority)</p> <ul style="list-style-type: none"> Implement resiliency measures when rebuilding subway service to Broad Channel, Rockaway Beach, and the Far Rockaways (pg. 126) Develop resiliency enhancement measures to protect the system against saltwater exposure through sealing of entry points, elevation of equipment, and use of watertight enclosures for equipment (pg. 126) Consider constructing additional shoreline protections along the Jamaica Bay/land boundaries to protect infrastructure. Consider strengthening bulkheads, elevating assets, and building protective barriers (pg. 126) 	<p>Continuity of operations – planning</p> <p>40a. Building owners should provide emergency power systems for facilities</p> <p>40b. Consider Presidential Policy Directive 21</p> <p>40c. Facilities should develop holistic plans to limit disruption of critical functions</p>	<p>Facility owners/operators, design professionals</p> <p>State and local officials, facility owners/operators, design professionals</p> <p>Facility owners/operators, design professionals</p>	
	<p>Continuity of operations – gas stations</p> <p>44a. Prepare a plan for maintaining fuel supplies</p> <p>44b. Protect subgrade fuel pumps from flooding</p>	<p>Facility owner, design professionals</p> <p>Facility owner, design professionals</p>	
	<p>Continuity of operations – transit facilities</p> <p>45a. Protect key utilities and ventilation equipment to the level applicable for critical facilities</p> <p>45b. Prepare a plan to protect critical assets</p> <p>45c. Install barriers to prevent floodwater</p> <p>46. Install submersible pumps</p>	<p>Facility owners/operators, design professionals</p> <p>Facility owners/operators</p> <p>Facility owners/operators, design professionals</p> <p>Facility owners/operators, design professionals</p>	
	<p>Continuity of operations – wastewater treatment plants</p> <p>47. Protect utility tunnels from flooding</p>	<p>Facility owners/operators, design professionals</p>	

* FEMA. 2011. *National Disaster Recovery Framework, Strengthening Disaster Recovery for the Nation*

ASCE American Society of Civil Engineers
 ASCE 24 ASCE 24, *Flood Resistant Design and Construction*

NJDCA New Jersey Department of Community Affairs
 NJDEP New Jersey Department of Environmental Protection

** HUD. 2013. *New York Recovers: Hurricane Sandy Federal Recover Support Strategy* (Federal Recovery Support Strategy) While these recommendations were developed for New York specifically, this report provides a useful model of the NDRF that can be applied in other locations.

BFE base flood elevation
 DCEA Division of Code Enforcement and Administration (New York State)
 FEMA Federal Emergency Management Agency
 MAT Mitigation Assessment Team
 NDRF National Disaster Recovery Framework

NYC New York City
 NYC DOB New York City Department of Buildings
 NYSDEC New York State Department of Environmental Conservation
 SFHA Special Flood Hazard Area

Table J-5: Crosswalk of MAT Recommendations with NDRF RSF – Natural and Cultural Resources

NDRF RSF Outcomes*	Hurricane Sandy Federal Recovery Support Strategy (NY)**	Supporting MAT Recommendation	Applicability
<p>Considerations related to the management and protection of natural and cultural resources and historic properties (NCH) resources, community sustainability and compliance with environmental planning and historic preservation requirements are integrated into recovery.</p> <p>Local communities, States and Tribal governments are ready to address post-disaster natural and cultural resource recovery needs.</p> <p>Programs to support disaster recovery, coordination of technical assistance and capabilities and data sharing are coordinated.</p> <p>Natural and cultural assessments and studies needed post-disaster, including proposed solutions to environmental and historic preservation policy and process impediments, are developed.</p>	<p>Beaches and dunes – Coordinate and provide beach and dune impact assessments [to provide outcome of] comprehensive assessment of the distribution and magnitude of storm impacts to the beach and dune system (pg. 134)</p> <p>Cultural Resources Recovery Priorities – Historic Resource Preservation</p> <ul style="list-style-type: none"> Identify which cultural resources were affected by the storm and characterize the types of damage incurred (pg. 146). Conduct rapid assessments of structures, sites, and landscapes more than 50 years old within the area affected by the storm surge as well as additional areas affected by other flooding and wind damage (pg. 146) Develop a geospatial database of cultural resources (historic and prehistoric) (pg. 146) Compile a list of types of impacts to historic resources so that specific preservation treatment recommendations may be developed to assist recovery efforts (pg. 146) Assist owners of affected properties by providing recovery advice, including specific technical guidance, possible sources of project funding, and places to go for help with unique or previously unidentified technical issues (pg. 147) Create a centralized clearinghouse that consolidates information on all of the federal assistance programs for which owners of cultural property (pg. 147) Provide information, technical assistance, project funding and program implementation support for long-term resiliency (pg. 148) Use the data gathered in the field survey to identify areas within the impact zone that have a high concentration of historic resources vulnerable (pg. 148) <p>Cultural Resources Recovery Priorities – Cultural Institution Preservation</p> <ul style="list-style-type: none"> Conduct preliminary assessment and analysis of storm impacts on cultural institutions (pg. 150) 	<p>Historic</p> <p>48a. Develop site-specific multi-hazard mitigation plans for landmark buildings</p> <p>48b. Protect historic structures that cannot be elevated</p> <p>49. Develop mitigation guidance for historic structures</p> <p>50. Evaluate retrofit options for historic building</p> <p>51. Protect critical building systems of historic structures</p> <p>52. Protect subgrade windows and doors</p>	<p>Facility owners, design professionals</p> <p>Facility owners, design professionals</p> <p>NJDCA, FEMA</p> <p>Facility owners, design professionals</p> <p>Facility owners, design professionals</p> <p>Building owners</p>

* FEMA. 2011. *National Disaster Recovery Framework, Strengthening Disaster Recovery for the Nation*

** HUD. 2013. *New York Recovers: Hurricane Sandy Federal Recover Support Strategy* (Federal Recovery Support Strategy) While these recommendations were developed for New York specifically, this report provides a useful model of the NDRF that can be applied in other locations.

FEMA Federal Emergency Management Agency
 MAT Mitigation Assessment Team
 NDRF National Disaster Recovery Framework
 NJDCA New Jersey Department of Community Affairs

Table J-6: Crosswalk of MAT Recommendations with NDRF RSF – Health and Social Services

NDRF RSF Outcomes*	Hurricane Sandy Federal Recovery Support Strategy (NY)**	Supporting MAT Recommendation	Applicability
<p>Restore the capacity and resilience of essential health and social services to meet ongoing and emerging post-disaster community needs.</p> <p>Encourage behavioral health systems to meet the behavioral health needs of affected individuals, response and recovery workers, and the community.</p> <p>Promote self-sufficiency and continuity of the health and well-being of affected individuals; particularly the needs of children, seniors, people living with disabilities whose members may have additional functional needs, people from diverse origins, people with limited English proficiency, and underserved populations.</p> <p>Assist in the continuity of essential health and social services, including schools.</p> <p>Reconnect displaced populations with essential health and social services.</p> <p>Protect the health of the population and response and recovery workers from the longer term effects of a post-disaster environment.</p> <p>Promote clear communications and public health messaging to provide accurate, appropriate and accessible information; ensure information is developed and disseminated in multiple mediums, multi-lingual formats, alternative formats, is age-appropriate and user-friendly and is accessible to underserved populations.</p>	<p>[Proposed Next Steps]</p> <p>a – Identifying opportunities ... to facilitate reconstitution and future mitigation [activities] (pg. 50)</p> <p>b – Building healthcare systems resilience through conducting comprehensive mitigation [and vulnerability] assessments (pg. 50)</p> <p>c – Identifying opportunities to support community health center siting and rebuilding (pg. 50)</p> <p>d – Development of strategies to provide interim and long-term services while [permanently restoring facilities] (pg. 50)</p> <p>Health Care and Public Health Resiliency</p> <ul style="list-style-type: none"> • Conduct a power needs analysis to determine the amount of power that is required to operate vital systems (pg. 109) • Have backup sources of power to maintain operations in the event of a loss of electric power. Backup generators should be installed with a fuel supply of at least 96-hours (pg. 109) • Ensure they are able to refuel generators (pg. 109) • Have redundant communications systems to increase the resiliency of operations, systems, and facilities (pg. 110) • All health care facility [systems] should be elevated and protected against exposure to flooding (pg. 110) • Consideration should be given to rebuilding or relocating essential services to higher floors that would be above flood surge levels (pg. 110) • Critical equipment and key infrastructure items should be raised to the level of best available flood hazard data plus one foot of freeboard (pg. 110) • Install combined heat and power (CHP) units ... to create steam... to be for heat and to potentially power chillers to provide air conditioning (pg. 110) 	<p>General conclusions and recommendations</p> <p>1a. Perform vulnerability assessments</p>	<p>State and local officials, facility owners/operators, design professionals, planners</p>
		<p>Codes and standards – New York State</p> <p>9. Modify the hospital code to make flood provisions mandatory</p>	<p>Building officials, State health commissioners</p>
		<p>Codes and standards – healthcare</p> <p>18. Revise IBC to reference NFPA</p> <p>19. Revise NFPA to reference ASCE 24</p> <p>20. Revise FGI to reference ASCE 24</p> <p>21. Revise FGI to provide specific guidance</p>	<p>FEMA, building officials, NFPA</p> <p>FEMA, building officials, NFPA</p> <p>FEMA, building officials, FGI</p> <p>FEMA, building officials, FGI</p>
		<p>Building systems – general</p> <p>34. Protect critical building systems in subgrade areas</p> <p>35. Establish points for temporary power connection</p>	<p>Facility owners/operators, design professionals</p> <p>Facility owners/operators, design professionals</p>
		<p>Building systems – elevators</p> <p>36a. Emergency plans should address the possibility of elevator failure</p> <p>36b. Facilities should protect elevator service, especially when it is essential to function</p>	<p>Facility owners/operators, design professionals</p> <p>Facility owners/operators, design professionals</p>
		<p>Building systems – fuel tanks and emergency pumps</p> <p>37a. Design installation of large fuel storage tanks to resist flotation and implosion</p> <p>37b. Protect tanks in subgrade areas from flood damage</p> <p>38. Install fuel pumps in large storage tanks to maintain operations</p> <p>39. Install sump pumps to remove seepage from subgrade areas</p>	<p>Facility owners/operators, design professionals</p> <p>Facility owners/operators, design professionals</p> <p>Facility owners/operators, design professionals</p> <p>Facility owners/operators, design professionals</p>
		<p>Continuity of operations – planning</p> <p>40a. Building owners should provide emergency power systems for facilities</p> <p>40b. Consider Presidential Policy Directive 21</p> <p>40c. Facilities should develop holistic plans to limit disruption of critical functions</p>	<p>Facility owners/operators, design professionals</p> <p>State and local officials, facility owners/operators, design professionals</p> <p>Facility owners/operators, design professionals</p>

Table J-6: Crosswalk of MAT Recommendations with NDRF RSF – Health and Social Services (concluded)

NDRF RSF Outcomes*	Hurricane Sandy Federal Recovery Support Strategy (NY)**	Supporting MAT Recommendation	Applicability
		Continuity of operations – healthcare	
		41. Healthcare facilities should develop a comprehensive plan for complete power loss	Facility owners/operators, design professionals
		42. Develop emergency plans that cover complete power loss for extended periods	Facility owners/operators, design professionals
		43a. Prepare key records before a significant storm event	Facility owners/operators
		43b. Protect critical function areas from flooding	Facility owners/operators, design professionals

* FEMA. 2011. *National Disaster Recovery Framework, Strengthening Disaster Recovery for the Nation*

** HUD. 2013. *New York Recovers: Hurricane Sandy Federal Recover Support Strategy (Federal Recovery Support Strategy)* While these recommendations were developed for New York specifically, this report provides a useful model of the NDRF that can be applied in other locations.

- ASCE American Society of Civil Engineers
- ASCE 24 ASCE 24, *Flood Resistant Design and Construction*
- FEMA Federal Emergency Management Agency
- FGI Facility Guidelines Institute
- IBC International Building Code
- MAT Mitigation Assessment Team
- NDRF National Disaster Recovery Framework
- NFPA National Fire Protection Association

Table J-7: Crosswalk of MAT Recommendations with NDRF RSF – Community Planning

NDRF RSF Outcomes*	Hurricane Sandy Federal Recovery Support Strategy (NY)**	Supporting MAT Recommendation	Applicability
<p>Hazard mitigation and risk reduction opportunities have been integrated into all major decisions and reinvestments during the recovery process.</p> <p>Increased community self-reliance and adaptability.</p> <p>Increased community-wide support and understanding of sustainability and resiliency principles applicable to the opportunities presented during disaster recovery.</p> <p>Enhanced interagency coordination of resources, requirements and support for building community capacity and community recovery planning.</p>	<p>Resilient Ecosystem Services Recovery</p> <ul style="list-style-type: none"> • Explore development of an integrated assessment and monitoring program addressing near-term and long-term storm impacts on critical ecosystem services (pg. 142) • Support ecosystem restoration and conservation planning and implementation projects that help meet both economic recovery and community resilience needs (pg. 144) <p>Land Use Shift/ Population Growth</p> <p>Work with partners to facilitate educational forums [to] information to the public and decision-makers on changes to the flood insurance program and its impacts on rebuilding, and assist with regional visioning (pg. 163)</p> <p>Community Planning and Plan Integration - Provide educational support, data, and tools to communities to encourage the evaluation, promotion and adoption of strategic planning concepts and products that reflect the values of the local communities and the goals of resilient/ sustainable practices (pg. 160)</p>	General conclusions and recommendations	
		1a. Perform vulnerability assessments	State and local officials, facility owners/operators, design professionals, planners
		Codes and standards – New Jersey	
		4. Develop training on flood provisions of New Jersey building code	NJDEP, NJDCA, FEMA
		5. Establish formal consultation process	NJDEP, NJDCA
		Codes and standards – New York State	
		7. NYSDEC should evaluate FEMA model floodplain management ordinance	NYSDEC
		10. Develop training on flood provisions of New York building code	DCEA, NYSDEC, FEMA
		11. Update DCEA technical bulletin on flood venting	DCEA, NYSDEC
		12. Amend New York State Code	DCEA

Table J-7: Crosswalk of MAT Recommendations with NDRF RSF – Community Planning (concluded)

NDRF RSF Outcomes*	Hurricane Sandy Federal Recovery Support Strategy (NY)**	Supporting MAT Recommendation	Applicability
	<p>Resilient Waterfront Recovery</p> <ul style="list-style-type: none"> Complete assessment and analysis of storm impact information for community waterfronts (pg. 140) Identification and development of best management practices to assist businesses in coastal areas in increasing resiliency to flooding (pg. 141) <p>Recreational Resource</p> <p>Facilitate completion of condition assessments on various recreational resources at the local, state, and regional levels. (pg. 150)</p>	<p>Codes and standards – New York City</p> <p>14. The DOB should establish a protocol to verify data 15. Establish mechanism for special inspections 16. Amend Appendix G of New York City Building Code</p> <p>Siting</p> <p>23a. Document performance of erosion control structures 23b. Review mapping procedures 24a. Review dune loss criterion 24b. Develop siting and design guidance for Sandy-affected coastal areas 24c. Identify barrier islands with history of breaching</p> <p>Structural – flood protection</p> <p>28. Local jurisdictions should determine what facilities are critical and essential 29a. Develop educational materials on below-grade flooding vulnerabilities 29b. Protect against flooding across subgrade connections</p> <p>Structural – elevating structures and freeboard</p> <p>30a. Elevate new and Substantially Damaged/Improved structures to protect from flooding 30b. Elevate existing structures to protect from flooding 30c. Building designs should account for flood conditions 30d. Improve protection of subgrade areas outside the SFHA 31. Designers should consider the potential impacts of sea level rise</p>	<p>NYC DOB NYC DOB NYC DOB</p> <p>FEMA FEMA FEMA FEMA</p> <p>Federal, State, and local officials, State SeaGrants, academia, planners</p> <p>State, local community FEMA</p> <p>Facility owners/operators, design professionals</p> <p>Local community Local community, building owners Local community, building owners/operators, design professionals, planners State, local community, building owners/operators, design professionals, planners Federal, State, and local officials, building owners, design professionals, planners</p>

* FEMA. 2011. *National Disaster Recovery Framework, Strengthening Disaster Recovery for the Nation*

** HUD. 2013. *New York Recovers: Hurricane Sandy Federal Recover Support Strategy (Federal Recovery Support Strategy)* While these recommendations were developed for New York specifically, this report provides a useful model of the NDRF that can be applied in other locations.

- DCEA Division of Code Enforcement and Administration (New York State)
- FEMA Federal Emergency Management Agency
- MAT Mitigation Assessment Team
- NDRF National Disaster Recovery Framework
- NJDCA New Jersey Department of Community Affairs
- NJDEP New Jersey Department of Environmental Protection
- NYC DOB New York City Department of Buildings
- NYSDEC New York State Department of Environmental Conservation
- SFHA Special Flood Hazard Area